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... FROM THE SEA:
Chemical and Biological Concerns

by:

James M. Murphy
Major, U.S. Army

A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: James M. Murphy

17 June 1994

Paper directed by Captain H. Ward Clark
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...FROM THE SEA

CHAPTER I

INTRODUCTION

November 28, 1943.

The S.S. *John Harvey*, part of a 15 ship convoy from America, sailed into the harbor of Bari, Italy and moored at pier 29. Externally *John Harvey* certainly looked innocuous enough, but her cargo was anything but normal. Only the Captain, Elwin Knowles, and a special crew from the Army's 701st Chemical Maintenance Company led by 1LT Howard Beckstrom knew the true nature of their shipment. In response to rumors that Nazi Germany was preparing to conduct chemical warfare the United States had placed two thousand, M47A1, hundred-pound mustard bombs on board.

The harbor was packed with over 30 allied ships. Unable to divulge what their cargo was, the *John Harvey* had to wait her turn to be unloaded just like the rest of the ships. For five days 1LT Beckstrom monitored the bombs for leaks or other signs of spillage while Captain Knowles tried, unsuccessfully, to get them moved up in priority. At dusk Captain Knowles noticed a lone plane flying high above the harbor. The

Luftwaffe reconnaissance pilot, Oberleutnant Werner Hahn, raced back to his base to report on the lucrative target. The stage was set for the greatest allied maritime disaster since Pearl Harbor.

At 1935 hours on 2 December the German Luftwaffe attacked Bari harbor with over 100 planes. Seventeen ships were totally destroyed and eight others were damaged. Yet the greatest tragedy of the attack occurred when the *John Harvey* exploded and her mustard bombs were blown apart. Liquid mustard began spreading across the harbor, mixing with the oil floating on the water. Some of the agent vaporized and mixed with the dark clouds of smoke blowing across the harbor and the town.

The crew of the *John Harvey* was killed in the explosion. No one else in the harbor knew of its deadly cargo. The men struggling in the water, the civilians working on the docks and in the town, and the rescue workers were all unaware of the mustard hazard. Over one thousand Allied military personnel and Italian civilians were killed. Over 600 additional personnel sustained severe wounds ranging from massive blisters to blindness. ¹

¹ Glenn B. Infield, Disaster at Bari (New York, The Macmillan Company, 1971).

CHAPTER II

... FROM THE SEA

"Where are our carriers?" General Colin Powell upon hearing that Iraqi forces had invaded Kuwait.

With the demise of the Soviet Union and the reduction of the global threat of communist expansion America's national security policy changed. President Bush first defined this new strategy in August 1990 at the Aspen Institute. The new U.S. national strategy focuses on regional threats as opposed to the previous global threat. To confront regional threats, the new U.S. military strategy emphasizes deterrence, defense, forward presence, crisis response and reconstitution.²

The U.S. Navy will play a key role in this strategy. In its new strategic document, "...FROM THE SEA", the Navy has shifted emphasis from traditional blue water operations to operations conducted along the coastlines of the world. The Navy has some significant capabilities to fulfill U.S. military strategy.

² Department of the Army, FM 100-5, Operations, (Washington: 14 June 1993), p. 1-3.

The Navy is uniquely suited to provide day-to-day deterrence. Because of international agreements on freedom of navigation, naval forces can operate for extended periods of time in a crisis area. These forces can remain close to coastal nations (beyond territorial waters) with little external support. Carrier battle groups can provide a visible air presence and they do not need basing rights. Amphibious Ready Groups (ARG) can also be a potent, visible display of U.S. resolve. All of these forces can be introduced or withdrawn rapidly and with little publicity.

If deterrence fails the Navy can provide important assets for crisis response. In many cases naval forces will be the first on site. "In August 1990, power projection aircraft on Eisenhower (CVN 69) and Independence (CV 62) were within range of Iraqi targets less than 48 hours after the President gave the order. In less than 30 days they were joined by two additional carriers."³ In addition to providing the first available air power, the Navy can provide the first available ground forces with an ARG.

The Navy also plays a crucial role in sustainment and reconstitution. Naval units can operate for extended periods with little or no support. Additionally, the Navy operates sealift ships that provide the majority of support to ground

³ Department of the Navy, White Paper Addendum 1993, NWC 3067, (Newport: 1993), p. 2.

and air units operating in a theater. Sealift provided 95 percent of all equipment and supplies during Desert Storm and Desert Shield.⁴

The carrier battle group and the amphibious ready group will continue to be the cornerstones of the Navy. However, future Naval forces will concentrate more on joint operations in the littoral environment. To successfully execute FROM THE SEA the Navy will need to focus on four key operational capabilities:

1. Command, Control and Surveillance
2. Battlespace Dominance
3. Power Projection
4. Force Sustainment.

The U.S. Navy has changed its strategic focus from "blue water" operations to littoral environment operations, this will put them at a greater risk from chemical and biological weapons. In subsequent pages I will look at how chemical and biological weapons can degrade the Navy's ability to perform these tasks.

⁴ White Paper Addendum 1993, p. 13.

CHAPTER III

CHEMICAL AND BIOLOGICAL WEAPONS

"Whether or not gas will be employed in future wars is a matter of conjecture, but the effect is so deadly to the unprepared that we can never afford to neglect the question." General John J. Pershing, Annual Report to Congress, 1919.

"The effects of [weapons of mass destruction] on a campaign or major operation, either through their use or the threat of their use, can cause large-scale shifts in objectives, phases, and courses of action. Thus, planning for the possibility of their use against friendly forces is critical to campaign design."⁵

FM 100-5 considers nuclear, biological and chemical weapons to be weapons of mass destruction. Chemical and biological weapons are relatively cheap to make. However, nuclear weapons are extremely expensive to develop and produce. They also require sophisticated scientific and engineering programs. Few nations currently have the resources and

⁵ FM 100-5, p. 6-10.

technological expertise to become nuclear powers. Therefore, I will not deal with nuclear weapons in this paper.

Chemical weapons can be divided into three major categories; persistent agents, non-persistent agents, and dusty agents. Each category has different properties and is used to obtain different results on targets.

Non-persistent agents are aerosols or vapors that will dissipate in minutes. Because they evaporate quickly, non-persistent agents are usually used to achieve immediate casualties or in areas that the user wants to occupy. Non-persistent agents present an inhalation hazard but not a percutaneous (skin contact) hazard. They can be defeated by proper use of protective masks.

For the purposes of this paper, persistent agents and dusty agents can be viewed together. Both categories have a percutaneous hazard as well as an inhalation hazard. Personnel exposed to these agents must wear chemical protective suits as well as protective masks. An adversary could use these agents to cause immediate casualties, delayed casualties, deny terrain, or degrade our operations by forcing us into a high Mission Oriented Protective Posture (MOPP).⁶ Figure 1 shows the typical characteristics of nerve agents and blister agents.

⁶ Department of the Army, FM 3-3 Chemical and Biological Contamination Avoidance, (Washington: 16 November 1992), p. 3-0.

PERSISTENT CHEMICAL AGENTS			
Type of Agent	Symptoms in Man	Effects on Man	Rate of Action
NERVE	Difficult breathing, sweating, drooling, nausea, vomiting, convulsions, and dim vision.	Incapacitates at low concentrations; kills if inhaled or absorbed through the skin or eyes.	Very rapid by inhalation or through eyes slower through skin.
BLISTER	Burning eyes, stinging skin, itching nose.	Blisters skin and respiratory tract; can cause blindness and death.	Blisters delayed hours to days; eye effects are more rapid.

Figure 1. Persistent Agents.⁷

Although persistent nerve agents can cause immediate casualties, they are used primarily as a liquid contaminant to cause delayed casualties by skin penetration. Any agent on the skin, if it is not immediately decontaminated, can cause death. Liquid agent on the ground will remain a contact hazard for several hours to several days and will produce a down-wind

⁷ Department of the Army, FM 3-7 NBC Handbook, (Washington: 27 September 1990), p. 43.

vapor hazard. Even a minor vapor will cause pupils to constrict, an effective weapon against pilots and anyone operating optical systems.

As a rule of thumb, persistency increases as temperatures decrease. High humidity, such as around coastal areas, tends to reduce the effectiveness of nerve agents. However, they would still be very effective for contaminating beaches, docks, and port facilities.

Blister agents are used to cause both liquid and vapor contamination. In its vapor form, blister agents affect the eyes and the respiratory system causing immediate casualties. In its liquid form, blister agents cause delayed casualties through skin irritation. Unlike nerve agents, high humidity tends to increase the effectiveness of blister agents making them especially useful in coastal areas.

History has shown that chemical weapons are devastating to unprepared forces. In the past the United States relied upon our chemical retaliatory capability as a cornerstone for deterrence. Since our national policy no longer allows us to use chemical weapons for retaliation, chemical defense capabilities and contingency plans for chemical environments are even more important than ever. As the number of nations with chemical weapons and sophisticated delivery systems increases planners will be forced to devote more thought to the chemical question.

CHEMICAL AND BIOLOGICAL CAPABLE NATIONS

"In April 1988, Iraq began Operation Blessed Ramadan to retake the Al Faw peninsula. The attack began on the morning of 17 April. Armored forces of the Republican Guard conducted the main attack. The Iraqi 7th Corps conducted a supporting attack along the west bank of the Shatt-al-Arab channel. The Iraqis also conducted two amphibious assaults along the western coast of the peninsula. The Iraqi plan called for a three-phase operation lasting four to five days. The employment of chemical weapons was an integral part of the Iraqi plan....Only 35 hours were required to complete the operation. The Iranians never recovered from the initial assault and were unable to reestablish an effective defense. The Iranian retreat across the Shatt-al-Arab turned into a complete rout, with the Iranians abandoning most of their equipment. The Iraqis did not win this battle solely by employing chemical weapons, but their impact was significant."¹

One of the significant factors affecting U.S. national security today is the proliferation of weapons of mass destruction.² Throughout the twentieth century the number of

¹ Major General Robert D. Orton and Major Robert C. Neumann, "The Impact of Weapons of Mass Destruction on Battlefield Operations," Military Review, December 1993, p. 64.

² U.S. Department of Defense, National Military Strategy, (Washington: January 1992), p. 1.

nations with chemical weapons has continued to increase with no end in sight. Because they are so cheap to produce, chemical weapons have been called "the poor man's atom bomb" and an ever increasing number of states are turning to them to bolster their national security.

In recent decades many nations around the Mediterranean Sea, the North Arabian Sea, and the rim of the Western Pacific, three traditional deployment hubs for the U.S. Navy, have joined the "chemical club". Today over 24 countries are suspected of having an offensive chemical weapons program and fourteen countries are suspected of having an offensive biological weapons program.¹⁰ As America shifts focus from one global adversary to a multitude of potential regional aggressors, the probability of encountering a chemical threat increases substantially.

¹⁰ Orton and Neumann, p. 65.

CHAPTER IV

IMPACT OF CB WEAPONS ON ...FROM THE SEA

The Chief of the United States Chemical Warfare Service writing in 1946 ca' lated that the use of gas by the Germans again st the Normandy beach-heads "might have delayed our invasion for six months".¹¹

FROM THE SEA capitalizes on some of the U.S. Navy's traditional strengths such as forward presence, amphibious operations, and sealift. To be successful with FROM THE SEA the Navy must perform four key operational functions. Chemical and biological weapons interact with each of these.

COMMAND, CONTROL, AND SURVEILLANCE

Because they are self-contained and can remain off shore for an extended time, naval platforms can provide command and control facilities for joint operations. Joint task force commanders have operated from naval platforms many times in the past and current plans call for this practice to continue in the future. However, as ships operate closer to land they

¹¹ Robert Harris and Jeremy Paxman, A Higher Form of Killing, (New York: Hill and Wang, 1982), p. 123.

become easier to target, especially from area effect weapons.

Chemical weapons are attractive not only because they cause casualties but because they can severely reduce operational effectiveness by forcing personnel into a higher MOPP level. Anyone who has worn a MOPP suit knows that they interfere with all individual actions. U.S. military field tests have shown that they interfere even more with unit operations. Communications, coordination, and decision making all suffer tremendous degradation in a chemical environment.

The best way to protect our operational command and control structures is with collective protection. The British Navy has recognized this problem and all of their ships are fitted with "Citadel" collective protection systems.¹² However, less than 33% of U.S. Navy ships are covered by collective protection systems.

Currently, the U.S. Navy has three levels of collective protection. Level I protects living spaces for part of the crew and medical facilities; Level II adds key operational spaces; and, Level III provides the maximum practical coverage. Most Navy ships are equipped with features that help minimize contamination such as ventilation fans and fittings that can be shut down, water washdown systems, airtight

¹² Interview with Commander J.C. Scoles, British Navy, U.S. Naval War College, Newport, RI: 13 December 1993.

compartments, and watertight compartments.¹³ However, without complete collective protection personnel are forced to work in MOPP 4. This degrades all functions from planning to controlling operations.

Chemical weapons interact with the surveillance process in several ways. First, planners must list their chemical concerns as a high priority among intelligence requirements. This starts long before any military operation begins. When a Unified CinC is formulating his theater assessment he must understand the chemical threat he will be facing and include chemical considerations. As Specified Command CinCs are reviewing training, budgetary and equipment requirements they must ensure chemical defense concerns are addressed.

Nerve agents are the preferred agents to use against ships operating off shore. Although the ships will still be harder to hit than a land based target, munitions do not need to hit ships directly to be effective. In fact, chemical weapons are uniquely suited to deny large areas. If a ship blunders through a cloud, even small concentrations of nerve agent will impair vision and manual dexterity. Flight operations will be curtailed and command and control functions will be degraded. Currently, the Navy lacks a reliable stand-off detector for

¹³ U.S. General Accounting Office, CHEMICAL AND BIOLOGICAL WARFARE - Use of Collective Protection on Vehicles, Aircraft, and Ships, Fact Sheet for the Chairman (Washington: September 1991), p. 4.

chemical agents. Additionally, current surveillance systems are incapable of detecting most biological agents.

Blister agents could also be used against ships, although they would be better suited to target beaches. One merely needs to review the tragedy at Bari harbor to recognize the potential damage blister agents can cause. Blister agent vapors can be detected up close but can not be detected from a distance, neither can blister agent liquid.

Chemical and biological weapons will have a significant impact on medical and personnel requirements as well. Normally personnel replacements on ships are done as individual requirements, we rarely need to replace large numbers of a ships crew. If a ship is damaged severely enough to cause that many casualties, we usually need to repair the ship as well as provide replacement personnel. Under a chemical attack the scenario is different. The ship will sustain very little damage, but the crew may be incapacitated. Personnel planners need to know what type threat they are facing so they can plan for all contingencies.

Logistics planners need accurate information on the chemical/biological threat as well. CENTCOM planners knew that Iraq had chemical weapons and had used them in the past. Command policy required every person in SWA to deploy with three protective suits and a lot of other chemical defense items. This equipment took up a lot of shipping space. For

future operations we need to ascertain not only the chemical and biological capabilities of an opponent, but their probable intentions as well so logistics planners can prioritize movement requirements.

BATTLESPACE DOMINANCE

Littoral warfare battlespace includes all the air, space, sea, and land areas involved in coastal operations. FROM THE SEA envisions the Navy as providing an "umbrella" that ensures access from the open sea to the coast and ashore. The Navy will be required to control the local seas and air to maintain safe access for all services. "Battlespace dominance is the heart of naval warfare."¹⁴

U.S. Naval forces have had a lot of practical experience in establishing and maintaining safe access from the sea to the shore. Naval air neutralizes the air threat. Amphibious forces move in and establish a beachhead, kill or capture the enemy ground forces, and establish a perimeter. No problem. But what if the ground is contaminated?

The U.S. public has become increasingly vocal about their zero tolerance for casualties. Although chemical and biological agents can cause deaths, their primary effect is to cause large amounts of casualties. Unlike casualties with

¹⁴ Department of the Navy, ...FROM THE SEA - Preparing the Naval Service for the 21st Century, NWC 3125, (Washington: September 1992), p. 8.

conventional wounds, CB casualties require long term care and their wounds are particularly hideous.

During World War I the mortality rate for chemical weapons was only around 1.5 per cent, leaving 98% of the affected personnel as casualties. The severity of the effects were enough to keep a man away from duty for two to three months or longer. In addition, a chemical casualty is much like the man wounded by a sniper, it takes two others to tend to him.

*"When some of the milder cases were evacuated each man had to be led like a blind man by an orderly to the ambulance car...The field hospitals were choked with casualties. Two days after the attack, the first deaths occurred. Dying was a slow and agonizing process. It was not necessarily the burns that killed, but the havoc the gas wrought in the throat and lungs."*¹⁵

Initially, establishing battlespace dominance may be relatively easy. However, as other options fail an enemy may resort to chemical or biological weapons. The longer we stay, the more likely an opponent will be willing to escalate.

¹⁵ Harris and Paxman, p. 24 and 25.

POWER PROJECTION

Power projection involves moving forces rapidly to generate offensive power at places and times of our choosing. Naval forces use mobility, flexibility and technology to mass our strength against an opponent's weaknesses.¹⁶ Once on station these forces can remain as long as necessary, or they can move into the interior of a country.

We have shown the world that we are the masters of high-technology war. U.S. forces can generate much more combat power, using our sophisticated systems, than any other nation. However, as technology increases so does complexity. As we have already seen, chemical and biological agents severely reduce effectiveness making complex operations almost impossible. Forcing us to operate in a contaminated environment may serve to level the playing field.

A future aggressor may try to avoid our strength and force us to operate at a slower pace by contaminating the environment. Using low-tech, WWI vintage mines, Iraq effectively limited our carrier task forces to the southern end of the Persian Gulf.¹⁷

Chemical mines can be very low tech. A random mine field could consist of several large containers (sea-land vans would

¹⁶ ...FROM THE SEA, p. 9.

¹⁷ Captain Charles R. Girvin III, "Twilight of the Supercarriers," U.S. Naval Institute Proceedings, July 1993, p. 44.

work well) filled with blister agent and sunk off-shore. These "mines" could be command detonated easily. An opponent could effectively deny large areas to us, or at least make us look very carefully before picking a landing site.

Power projection requires maneuvering from the sea, across the coast, and into the interior of the country. Maneuvering on the sea is not quite the same as maneuvering on land but some of the principles are the same. The first principle of maneuver is quickness. A series of violent, rapid acts can shatter an opponent's will to resist.

However, contaminated environments slow the pace of all functions. Everything from command and control to logistical operations will take longer. If the enemy can continue operations behind the coast, in an uncontaminated environment, he will have a decided advantage. If he is also in the contaminated environment the degradation to his operations may not be as damaging since his forces would be designed to operate at a slower pace anyway.

Surprise is another principle of maneuver and it is critical to amphibious operations. One of the keys to a successful amphibious operation is to land where or when the enemy does not expect. Chemical weapons can make surprise difficult to achieve. With their large area coverage and long-term effects, an enemy can use chemical weapons to deny large portions of his coast for long periods without occupying the

terrain. Without long range detectors U.S. Naval forces would not know if an area was contaminated until reconnaissance personnel physically checked, most likely becoming casualties in the process.

Another key to amphibious operations is to avoid enemy mines. I have already discussed how easy it would be to establish a chemical mine field. The big difference between chemical and conventional mines is that once a conventional mine explodes the threat is gone. When a chemical mine explodes, the threat is just beginning.

FORCE SUSTAINMENT

Force sustainment is the last of the four key operational functions required under FROM THE SEA. As stated earlier, Naval forces are normally the first to arrive on scene. As heavier forces arrive, they remain dependent on sealift for sustainment.

The key to force sustainment is getting the support from the ships to the users on the land. Chemical and biological weapons could be used effectively to contaminate port facilities, staging areas, and transportation nodes. Most nations would hesitate to contaminate their own territory. However, recent history has shown that there are some leaders who are willing to contaminate their own land and will even risk casualties among their civilian population.

An enemy who is willing to contaminate staging areas or transportation nodes would cause problems for our force sustainment efforts. Currently, the United States military does not have the capability to decontaminate large areas. Personnel working in these areas would be forced to operate in MOPP 4, slowing their pace. Decontamination units would need to clean equipment as it left staging areas to prevent spreading the contamination.

Contaminating port facilities would cause even bigger problems. 95 per cent of the supplies and equipment for Operation Desert Storm came through two ports. If Iraqi forces had contaminated either of these ports, Desert Storm would have been significantly different.

An enemy could rationalize that he is going to lose control of the ports anyway, so he might contaminate them. Maintaining the contamination would not be very difficult, even if we have air superiority. The preferred method of delivery would be in SRBMs. Chemical warheads would decrease the missiles' accuracy, but that is a small problem for an area effect munition.

U.S. ability to stop SRBMs consists of knocking them out of the sky with a PATRIOT. This would not destroy the agent, it would merely contaminate the ground below the impact. Iraqi forces fired many SCUD missiles at the city of Riyadh. Although all of the missiles were successfully engaged by

PATRIOTS, debris from over 24 SCUDs fell on the city. Fortunately, none of the warheads carried chemical or biological agents.

Decontaminating port facilities would be almost impossible. It would be extremely difficult to neutralize large amounts of agent and protect the environment at the same time. Merely washing the agent into the sea may not be an acceptable solution. However, working in a contaminated environment would be slow and difficult.

The goal of FROM THE SEA is to prepare the Navy to win regional conflicts. America's future enemies are studying FROM THE SEA now. Their goal is not to conquer America, but to make things so difficult for U.S. forces in a regional conflict that we will acquiesce to their actions.

CHAPTER V

CONCLUSIONS

During the Iran-Iraq war both sides attempted to use chemical weapons. Although Iran achieved little success, Iraqi forces developed efficient delivery systems and a sophisticated offensive chemical doctrine. Chemical weapons planning became an integral part of all major operations and campaigns. Iraq's demonstrated success with chemical weapons during the Iran-Iraq war influenced all aspects of American planning and operations for Desert Shield and Desert storm.

There were many significant differences between the belligerents of the Iran-Iraq War compared to Desert Shield/Storm. The natures of the two wars were also fundamentally different. However, it is hard to tell what kind of "lessons" will be learned by future adversaries that study Iraq's success in one and their dismal defeat in the other.

Other nations recognize that America leads with its Naval forces. Since no other nation has the capability to successfully engage U.S. forces on the open sea they will focus on frustrating us in coastal areas. Chemical and biological weapons can severely impair the key operational functions necessary for FROM THE SEA to succeed.

U.S. forces must prepare now to meet that challenge. The Navy should increase collective protection on ships. They should also support development of standoff detectors and a large-area decontamination capability. Unified CinCs must keep chemical detection and protection items high on their integrated priority lists. They should also continue to exercise chemical scenarios in their regional contingency wargames.

The United States has not been forced to operate in a contaminated environment since World War I. As aggressor nations run out of options for successfully combatting America, how long will it be before one of them tries the chemical solution?

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